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C-018H-P3
Revision 0

PROCUREMENT SPECIFICATION

COLLECTION SYSTEM
LOCAL CONTROL UNIT AND MCS INTERFACE DEVICES

Work Order CR9583

OFFICIAL RELEASE
BY C-018H IMT
DATE 10-15-93
STATION 37 CLERK 69

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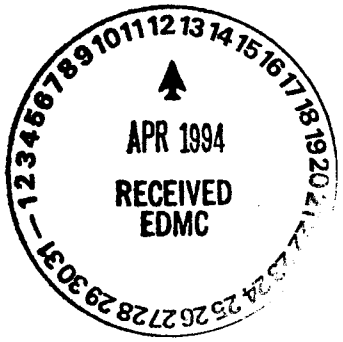
For the U.S. Department of Energy
Contract DE-AC06-87RL10900



APPROVED

Kaiser Engineers Hanford Company (KEH)

Lead Engineer	10/14/93 Date	Technical Documents	10-14-93 Date
Checker	10-14-93 Date	Safety	10.14.93 Date
Environmental	10.14.93 Date	Quality Engineering	10-14-93 Date
Project Management	10.14.93 Date		

Westinghouse Hanford Company (WHC)

Projects Department	10/14/93 Date

RELEASED FOR PROCUREMENT

U.S. Department of Energy	10/14/93 Date

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1 SCOPE

1.1 STATEMENT OF WORK: This specification establishes the requirements for a Local Control Unit (LCU) for control of effluent transfer through a 1500 foot pipe-in-pipe system connecting the Liquid Effluent Retention Facility (LERF) Collection System to the C-018H Effluent Treatment Facility (ETF) located on the U.S. Department of Energy's (DOE) Hanford Site at Richland, Washington. This specification also establishes the requirements for communications interface devices to integrate the LCU into the ETF MCS's data highway and enable communication between the ETF Monitor and Control System (MCS) and the 242A Evaporator MCS.

1.1.1 The LCU will be used to monitor and control the transfer of wastes from the LERF Basins to the ETF influent system for storage and treatment.

1.1.2 The communications interface devices enable monitoring and control of liquid transfer from the 242A evaporator to the ETF by the ETF MCS and 242A Evaporator MCS.

1.2 WORK INCLUDED: Design, fabrication, inspection, testing, documentation, packaging, shipping, and site services for the equipment, and software described in this Specification including the following:

1.2.1 LCU hardware and software.

1.2.2 Interface device hardware and software.

1.2.2 LCU uninterruptible power supplies (UPS) and enclosure.

1.2.3 Wiring and cabling.

1.2.4 Interface device hardware and software.

1.2.5 Identification and marking.

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1.3.3 Wiring between UPS and LCU.

1.3.4 Process instruments.

1.3.5 Software programming of PLC-5.

1.4 FURNISHED EQUIPMENT

1.4.1 The PLC-5, with a 1785 KB serial interface module, will be provided by the Buyer.

2 APPLICABLE DOCUMENTS: The following codes, standards, and drawings form a part of this Specification to the extent defined herein.

2.1 Federal Standards (FED STD)

FED-STD-1003A	Synchronous Bit Oriented Data Link Control Procedures (Advanced Data Communications Control Procedures)

2.2 Federal Information Processing Standards (FIPS) (Department of Commerce)

1-2 (1984)	Code for Information Interchange, Its Representations, Subsets, and Extensions
17-1 (1977)	Character Structure and Character Parity Sense for Serial-By-Bit Data Communication in Code for Information Interchange
107 (1984)	Local Area Networks: Baseband Carrier Sense Multiple Access w/Collision Detection Access Method and Physical Layer Specifications and Link Layer Protocol
146 (1991)	Government Open Systems Interconnection Profile (GOSIP)

2.3 Instrument Society of America (ISA)

S50.1-1975 (1992)	Compatibility for Analog Signals for Electronic Industrial Process Instruments

2.4 National Electrical Manufacturers Association (NEMA)

ICS 6-1988	Enclosures for Industrial Controls and Systems

2.5 National Fire Protection Association (NFPA)

70 (1993)	National Electrical Code

2.6 Underwriters Laboratories (UL)

Electrical Appliance and Utilization Equipment Directory	1993
Electrical Construction Materials Directory	1993

3 REQUIREMENTS

3.1 SYSTEM DESCRIPTION

3.1.1 Overview: The LCU for the C-018H Collection System is to be integrated into the C-018H ETF MCS. The 242A Evaporator MCS and ETF MCSs are to pass status and alarm signals to each other through interface devices including an existing Allen-Bradley PLC-5 configured to transmit and receive data from the 242A MCS I/O ports.

3.1.2 System Function: The Collection System LCU shall monitor and control the LERF and effluent transfer from the 3 basins' pump stations to the ETF. The LCU shall be monitored by and communicate with the C-018H MCS. A local operator interface (LOI) shall be provided at the Collection System LCU to provide local access to operating parameters at the LERF pumping stations. The 242A MCS and ETF MCS shall exchange pump status, valve status, and other required process information to facilitate steam condensate transfer from the Evaporator to the ETF influent Surge Tank. Communication interface devices will enable two way communication between the ETF and 242A MCSs.

3.1.3 System Integration

3.1.3.1 The LCU will communicate to the ETF MCS Operator Control Stations (OCS) via the dual data highway provided by the C-018H project. The LCU will be connected to the dual data highway within the ETF by appropriate interface devices. The LCU will be connected singly into the interfacing

devices in a single non-redundant link via modems. The telecommunications system between modems will be supplied by the Buyer.

3.1.3.2 The 242A MCS will also communicate to the ETF MCS OCS. An Allen-Bradley PLC-5 located in the 242A Evaporator control room will communicate with the 242A MCS through the PLC-5 and 242A MCS input/output (I/O) points. The PLC-5 will be connected singly into the ETF MCS interface devices in a single non-redundant link via modems. The telecommunication system between modems and the PLC-5 are supplied by the Buyer.

3.1.4 System Components: The LCU shall be modular and use the same components used to build the C-018H MCS system, a Micon A/S Open System. Controllers shall vary only in their I/O requirements. The same revision software shall be provided in the Collection System LCU and interface devices that is provided in the C-018H MCS system to maintain compatibility. No substitute equipment or software will be allowed.

3.2 SYSTEM PERFORMANCE

3.2.1 System Update Time: The LCU shall be capable of monitoring and dynamically updating inputs, digital and analog, at a rate of at least 5 times per second. Outputs shall be capable to be dynamically updated at least ten times per second to control the process.

3.2.2 Display Update Time: Dynamic information on the ETF OCS displays shall be updated with new information from the LCU and PLC-5 at least once every 2 seconds, assuming exception reporting criteria have been met.

3.2.3 Alarm Update Time: Alarms shall annunciate on the ETF OCS's cathode ray tube (CRT) within 2 seconds of sensing at LCU or PLC-5 input.

3.2.4 Communication Time: LCU-to-LCU, LCU-to-PLC-5, or PLC-5-to-LCU communication of process values shall not exceed 2 seconds, assuming exception reporting criteria have been met.

3.2.5 Control Response Time: Control changes entered at the ETF OCS shall be received by the LCU or PLC-5 within 2 seconds.

3.2.6 Security Requirements: Modification of process parameters, alarm set points, etc shall be under password/key control. Minimum of nine unique passwords shall be available, accessible at the ETF OCS level only.

3.3 SYSTEM REQUIREMENTS

3.3.1 Operating Life: Design components, modules, and equipment so that with normal maintenance, the LCU shall have minimum useful operating life of 10 years.

3.3.2 Software License: Obtain approval of software license agreements before procurement of LCU. Software licensee shall be Westinghouse-Hanford Company. If custom software is used, updates to system shall be performed without procurement of additional software. Software provided as part of

the LCU that is resident in volatile memory shall not be copy protected. WHC shall be permitted to make unlimited backup copies for protection against loss of the primary copy.

3.3.3 Electrical Power: LCUs, communication, and companion equipment shall operate on single-phase 120 (+5) volt ac at 60 (+1) Hz power. Design ac power wiring and grounding within MCS in accordance with the National Electric Code (NFPA 70).

3.3.3.1 The Seller shall state the total ac power requirements of the MCS in the proposal. The Seller shall submit a summary of the power requirements and heat loads for each major piece of equipment as part of the installation instructions.

3.3.3.2 All ac electrical equipment supplied shall be Underwriters Laboratory (UL) approved.

3.3.4 Environmental: Equipment provided shall be capable of being stored without damage at temperatures ranging from 20 to 140°F.

3.3.4.1 The LCU will be located in a controlled environment shed. The LCU shall be rated for continuous operation over the temperature range of 50 to 104°F within relative humidity range of 20 to 80% noncondensing.

3.3.4.2 The LCU enclosure shall be a wall mounted cabinet designed to house one 19-inch subrack. The enclosure shall have dual swing frame features with front and rear equipment access. Field I/O shall connect to separate terminals at the rear of the enclosure. Field terminals shall be factory prewired to the controller modules. The LCU enclosure shall be air cooled via an integrally mounted door. A local operator interface shall be mounted in the enclosure door.

3.3.4.3 Provide cooling and venting of the UPS enclosure per UPS manufacturer recommendations.

3.4 REQUIRED SYSTEM FUNCTIONS

3.4.1 Local Operator Interface: The LOI shall meet the following requirements:

3.4.1.1 Organize displays in logical manner in commonality with the C-018H OCS displays.

3.4.1.2 Provide a minimum of 125 group displays with a minimum of 8 faceplate displays per group. Provide flexibility to place any loop, discrete input, analog input, calculated variable or manual entry into any of the eight positions in the group display.

3.4.1.3 Provide display of tag name, setpoint, process value, output and mode for each loop.

3.4.1.4 Provide discrete status names, with up to 4 states, with each discrete tag name.

3.4.1.5 Provide tag name and value for inputs, calculated variables and manual entries. Provide means to view the controller tag list for that LCU.

3.4.1.6 Show the 5 most recent alarm points from that LCU on all of the LOI's displays in a similar format as the OCS displays. Include time of occurrence, priority, tag and type.

3.4.1.7 Provide an alarm acknowledgement key on each display to acknowledge the alarms.

3.4.1.8 Provide "fill in the blanks" type configuration for assigning group displays.

3.4.1.9 Provide a buzzer for audible alarm functions.

3.4.2 Security Requirements: LOI security requirements are summarized below. Provide security levels as follows:

(a) Level 1: supports monitor-only functions.

(b) Level 2: support modification of set points or output signals; on or off, or start or stop control; batch sequence initiation; initiation of current trending; and alarm acknowledgment.

(c) Level 3: support Level 2 capabilities and modification of alarm limits and alarm inhibits.

(d) Level 4: support Level 3 capabilities and modification of tuning parameters and configuration functions.

3.4.2.1 Provide a default security scheme which permits level one access only to be automatically selected. Provide a minimum of 2 digit password for access to the LOIs security level 2. Provide absolute denial of access to security levels 3 and 4.

3.4.3 Local Control Unit: The LCU shall meet the following requirements:

3.4.3.1 The LCU shall continuously monitor and control its associated I/O. Scan, calculation, and output update rates shall be a minimum of 1 second. Conversion, characterization, scaling, computations, and output control shall be independent of other network nodes. Each input, output, or calculated value, either analog or discrete, shall be capable of being tagged so that status may be displayed on OCSs. Analog control functions shall be available for use with analog I/O points and discrete control functions shall be available for use with discrete I/O points.

3.4.3.2 Input characterization: Control software shall scan each input and provide the following: Analog-to-digital conversion of analog inputs; Assignment of engineering units and scaling; Alarming of inputs.

3.4.3.3 PID control: Provide PID algorithms with the following features: PID function with selection of gain, reset, and rate; Adaptive gain; Cascade control; Ratio control; Auto/manual with bumpless transfer; Self-tuning algorithm; Feed forward control; feed back control.

3.4.3.4 Math functions: The following calculations shall be available:

a) Addition, subtraction, multiplication, division, absolute value, average, and moving average.

b) Square root, logarithm, exponential, and polynomial.

c) Totalizer/integrator with roll-over capability.

3.4.3.5 Other functions: Provide the following additional functions:

a) Input characterization by curve fit or lookup table (10 point minimum).

b) High/low selector.

c) Lead/lag, dead time, velocity limiting.

d) Output, set point, ramp limits.

e) Comparisons (less than, greater than, and equal to).

3.4.3.6 Alarming:

a) Alarms shall be generated on analog inputs or calculated values for deviation, rate, and 2 levels.

b) Bad signal alarm shall be generated for input voltages that are out of range.

c) Alarms generated from analog values shall be available for use in discrete logic functions.

d) For discrete inputs or logic computation results, alarms shall be assignable to either one or zero state at KEH's option. If the zero state is chosen for the failed or alarmed state, the limits in the analog database shall not be reversed.

3.4.3.7 Discrete logic functions: The following discrete logic functions shall be available as a minimum: AND, OR, and inversion; Storage (latch); Counters, each capable of counting up to 99,999 events with roll-over capability; Timers.

3.4.3.8 Output functions: The following output functions shall be available as a minimum:

a) Calculated analog values or manual values (supervisory determined) shall be linked to analog outputs for control during configuration.

b) Calculated or manually set discrete values shall be assignable to discrete outputs.

c) Outputs shall be either normal or reverse optional during configuration.

d) It shall be possible to change source of output control dynamically on occurrence of alarm or discrete event.

3.4.3.9 Batch/sequence control: Batch/sequence control functions shall be a set of sequentially executed instructions or function blocks. Make provision for storing batch recipes for recall and execution. Batch/sequence, if required by design, control functions shall provide the following features:

(a) Batch/sequence initiation from OCS, on alarm, or on occurrence of event.

(b) Set point change on occurrence of event (alarm, discrete status change, timer, or preset analog limit).

(c) Start/stop of equipment on event occurrence.

(d) Decision and branching within sequence.

(e) Passing of supervisory input (temperature, time, level, etc.) to sequence program for control.

(f) Generation of text messages at OCS steps in sequence.

(g) Batch/sequence hold points requiring supervisory decision.

(h) Batch/sequence termination on completion, on alarm occurrence, or by command.

3.4.4 Collection System LCU Process Communications shall meet the following requirements.

3.4.4.1 LCU Diagnostics

a) The LCU shall perform automatic self diagnostics after power up or restart conditions.

b) Self diagnostics shall test memory and I/O buses as a minimum and shall isolate faults to the module level.

c) The LCU shall also perform periodic online status diagnostics that determine if major components are operating correctly.

d) Status diagnostics shall test, as a minimum, processors, memory, I/O buses, peripherals, and communication links critical to the ability of the MCS to perform monitoring and control.

e) Execution of status diagnostics shall not inhibit MCS from performing monitoring and control functions.

f) Indications of faults shall be clearly displayed at OCSs and LCUs.

3.4.4.2 Process communications:

a) Provide star type communications capability that links the LCU into the dual data highway. A plant integrated voice data telephone system with modems described in this specification will be used to link the LCU to the dual data highway.

b) Communications network shall be monitored for faults by on-line diagnostics.

c) Communication protocol shall support error checking and retransmission upon error detection. Communication system shall incorporate, with each block of data, at least 16 parity bit error detection scheme similar to FED STD-1003A.

d) The communications interface to the communication networks is to be in compliance with the following FIPS Numbers 1-2, 17-1, 107, and 146.

3.4.5 Process communication through the PLC-5 shall meet the following requirements:

3.4.5.1 PLC-5 Diagnostics: Communications network shall be monitored for faults by on-line diagnostics. Faults shall alarm on the ETF OCS and the capability to alarm on the 242A OCS.

3.4.5.2 Process communications

a) Provide star type communications capability that links the PLC-5 into the dual data highway.

b) Communication protocol shall support error checking and retransmission upon error detection. Communication system shall incorporate, with each block of data, at least 16 parity bit error detection scheme similar to FED STD-1003A.

c) The communications interface to the communication networks shall comply with the FIPS 1-2, 17-1, 107, and 146.

3.5 EQUIPMENT

3.5.1 LCU General: The LCU shall provide continuous control and monitoring independently of the C-018H OCSs and data highway. The LCU shall be provided with local control capability from an operator interface with touch screen and remote control capability from the control room OCSs.

3.5.1.1 The LCU shall accept supervisory control information (set point change, start/stop, sequence initiation, and tuning parameter changes) and configuration changes from control room OCS, and provide process status information by communication network to OCS and other communication nodes.

3.5.1.2 Process control changes shall not require entering configuration mode or interruption of control.

3.5.1.3 The LCU shall be interfaced for termination of associated I/Os. LCU shall contain a controller, signal conditioning, power supply, termination panels and an externally mounted uninterruptible power supply as well as any necessary additional equipment to perform the previously defined functions.

3.5.1.4 LCU shall consist of two redundant multi-loop controllers. LCU control modules shall be standardized. Controllers shall be multi-loop with capability for both discrete and/or analog I/O.

3.5.2 LCU Enclosure: LCU hardware shall be housed in a wall mounted NEMA ICS 6 Type 12 fan cooled enclosure. Fully assemble enclosure and install all required equipment to make LCU functional. Provide air filtering and fans of sufficient capacity to operate in environment specified in Paragraph 3.3.4.

3.5.3 LCU Terminations: The following termination types are required:

3.5.3.1 Analog inputs (4-20 milliamperes). Provide 1 for shield, and 2 for 4-20 mA signal.

3.5.3.2 Analog inputs (voltage). Provide 3 terminal points: 2 for signal, and 1 for shield.

3.5.3.3 Discrete I/O. Provide 2 terminal points.

3.5.3.4 Shielded terminal points shall be internally connected to isolated ground bus.

3.5.3.5 Terminals shall be clearly marked with numbers or functional designation as appropriate.

3.5.3.6 Termination strips shall be connected to I/O system modules using Contractor-provided, prewired, multi-conductor cable.

3.5.3.7 Provide 24 to 28 V dc power for field transmitters at termination panels for analog inputs.

3.5.3.8 Terminal strips to have light emitting diode (LED) for each discrete output to provide trouble shooting mode for system.

3.5.3.9 Terminal strips to be three tired and labeled TS-X where X will be the number of the associated I/O module.

3.5.3.10 Segregate the I/O into banks to correspond to the I/O number of the I/O module.

3.5.3.11 Terminal strips to be numbered and wired using the same position number throughout.

3.5.4 LCU Power supply: 24 to 28 V dc power supply for field transmitters shall have current output sufficient to power 4-20 milliampere analog inputs at the LCU. Provide power supply fail alarm signal back to the control room OCSs. Transmitter loop power shall be fused or current limited so shorting of 1 or more loops does not affect other loops on same supply.

3.5.5 LCU I/O Modules: LCUs shall provide the I/O modules shown in Figure 1. I/Os designed for 4-20 milliamperes signals shall meet applicable requirements of ISA-S50.1.

3.5.5.1 Analog inputs: Provide the following capabilities for the LCU's analog inputs:

(a) LCUs shall accept analog inputs of 4-20 milliamperes with the addition of the proper cards.

(b) LCUs shall accept thermocouple and RTD types with addition of appropriate I/O module.

(c) Analog-to-digital conversion of inputs shall have resolution of not less than 10 bits plus sign bit and input impedance of 1 megohm minimum.

(d) Combined error attributed to nonlinearity, drift, offset, resolution, etc. shall not exceed 0.25% of full scale.

(e) Common mode rejection ratio shall be at least 60 decibels from dc to 60 Hz achieved by differential input.

(f) Inputs shall be provided with transient voltage surge arresters for protection against unintentional power contacts, lighting, etc.

3.5.5.2 Analog outputs: Analog outputs shall be 4-20 milliamperes with resolution of not less than 10 bits (0.02 milliamperes) and combined error

not to exceed 0.5% of full scale. Outputs shall be capable of driving 0 to 600 ohms.

3.5.5.3 Discrete inputs. Discrete inputs shall be optically isolated. Isolation shall be 500 volts minimum.

3.5.5.4 Discrete outputs: Discrete outputs for control of ac voltages shall be either dry contacts or solid-state relays with optical isolation. Contacts shall be rated at 120 V ac at 2 A minimum except where specifically noted.

3.5.6 Local Operator Interface: The LOI shall consist of a flat electroluminescent display screen mounted in the door of the LCU. The LOI shall be sealed to eliminate direct exposure to the environment.

3.5.6.1 LOI unit shall access the controller bus to have capability to access any information generated within its LCU but shall be independent of the external communications network connecting the OCSs to the LCUs.

3.5.6.2 Capability must be provided to access and/or control both analog loops and digital on/off devices.

3.5.6.3 Local alarm display annunciation is required.

3.5.6.4 The LOI shall provide Levels 1 and 2 monitoring and control in accordance with Paragraph 3.4.2. The LOI shall be capable of being locked into Level 1 mode for monitor-only mode. Access to Level 2 shall be by password.

3.5.6.5 Minimum size of the LOI screen shall be 6 inches high by 9 inches wide. Provide sealed infrared touch actuation on the LOI screen surface.

3.5.7 Uninterruptible Power Supplies: Provide a UPS of the same Manufacturer as those used in Project C018H. A minimum UPS of 1200 watts capacity is required to support the LCU. The UPS shall be mounted in a NEMA ICS 6, Type 12 enclosure with an enclosure stand height of 6 inches minimum.

3.5.7.1 Furnish the UPS with terminal strips mounted within the enclosure or an integral junction box. Completely wire the UPS to the terminal strip and identify all termination points. Wiring from the UPS's terminal strip will be provided by the Buyer.

3.5.7.2 Provide low battery alarm and ac fail outputs from the UPS or the UPS terminal strip.

3.5.8 Controller racks: Supply one controller rack with the controllers specified below. Redundant U-32 modules in Slots A and B. A single (non-redundant) RCM-A module in Slot C. A single (non-redundant) RCM-Dr module in Slot D.

3.5.9 Interface Devices: The data highway interface devices shall serve as an intelligent interface between the ETF MCS Token Passing dual

data highway and the star connected LERF Basin LCU and 242A Allen-Bradley PLC-5 (1785-KE Serial Interface Module), provided by the Buyer. The interface devices shall conform to the following:

3.5.9.1 The interface devices shall be fully redundant.

3.5.9.2 The interface device's line voltage shall be 115 V ac/60 Hz.

3.5.9.3 Device failures shall be transmitted to the ETF OCS as alarms.

3.5.9.4 Configure the two interface devices for installation in the existing ETF rack, provided by the Buyer.

3.5.10 Telephone Modem: Provide one 19.3 KBAND modem configured to fit in a 19-inch ETF modem rack, provided by the Buyer. Label this modem with the LCU number.

3.5.11 Wiring and Cable Terminations: Wiring and cabling is to be supplied with the proper terminations to interface to the system. Identify all wiring by color coding and\or wire markers. LCU star communication wiring between modems to be supplied by the Buyer. Wiring between LCU55M17-UPS and LCU55M-17 to be supplied by the Buyer. Wiring between LCU55M-17 and modem to be supplied by the Buyer.

3.6 HARDWARE MAINTAINABILITY

3.6.1 Modularity. LCUs, signal conditioning equipment, communications equipment, I/O boards, UPSs and power supplies shall be modular in construction and capable of being plugged into power distribution rack.

3.6.2 Power on replacement. RCM controllers, U-32 controllers and other communications equipment shall be capable of being changed with system power on with no operational effects (continued operation) and no damage to system components.

3.7 REDUNDANCY

3.7.1 The LCU shall have redundant controllers. The secondary controller shall be in hot standby, or parallel operation, and its status (normal/failed) shall be continually monitored. Switching from primary to secondary components shall be automatic and occur within 1 second of failure. Automatic switching shall be logged on the ETF log printer and appropriately displayed. Upon assuming control, the redundant controller shall not require downloading of process information from the ETF OCSs. Transfer shall be bumpless.

3.7.2 Interfacing of the Star connected LCU and PLC-5 to the ETF's dual data highway shall be accomplished with redundant interface devices.

3.8 IDENTIFICATION AND MARKING

3.8.1 Permanently label the LCU enclosure with LCU Identification Number LCU55M-17. Permanently label the UPS enclosure with UPS LCU Identification Number LCU55M17-UPS. Clearly identify and permanently mark major subassemblies and printed circuit boards with Contractor's normal part numbering scheme.

3.8.2 Clearly and permanently label cables and wiring between subsystems. Labeling shall correspond to wiring designations on Contractor's drawings and schematics.

3.8.3 Identify documentation with vendor information number. Prominently locate item identification number on cover or first page of documents. In addition, identify documentation with descriptive title, Contractor's document number (if different from identification number), revision letter, and revision date.

3.8.4 Assemble approval data and subsequent vendor information sets into packages with cover title page identifying included documents and drawings by number and title.

3.9 DRAWINGS AND DIAGRAMS

3.9.1 Prepare drawings and diagrams defined in the following paragraphs on a computer-aided drafting system compatible with AUTOCAD, Release 12. Utilize "E" sized drawings, 28 by 40 inches.

3.9.2 Provide drawings and diagrams on both mylar and 5-1/4 or 3-1/2 inch diskette in DOS format compatible with AUTOCAD.

3.9.3 Provide block diagrams and engineering drawings illustrating the LCU. Drawings shall contain complete parts lists with the vendor's part numbers, quantities, and material descriptions.

3.9.4 Provide wiring diagrams showing cables, wiring, and wiring terminations. Wiring diagrams shall delineate termination panels for field devices and provide space to label each I/O point with field instrumentation tag numbers, 12 characters minimum. Provide 2-way traceability for wire run and tag numbers.

3.9.5 Diagrams shall show operation of equipment systems, in enough detail to provide clear understanding and permit troubleshooting of installation. Designate wires with numbers or letters and retain same designation throughout, independent of splices at terminal blocks.

3.9.6 Submit drawings and diagrams for approval. Provide final "as-built" drawings, which include changes occurring between initial "Approval" set and delivery of system.

3.10 MANUALS

3.10.1 Technical: Standard 8-1/2 by 11 inches with exception of drawings or foldouts. Manuals shall be of a quality sufficient to reproduce legible copies.

3.10.2 Hardware: Include equipment description, maintenance and servicing (including diagnostics) schematic diagrams, complete parts lists, and recommended spare parts.

3.10.3 Software reference: Provide manuals for programming language compiler, operating system, computer operating software installation, diagnostics software, and system debugger.

3.10.4 Configuration: Provide manuals that delineate methods required to configure the LCU. Manuals shall cover background information on the use of function blocks.

3.11 EQUIPMENT SALVAGE PLAN: Provide an equipment salvage plan for reconditioning equipment exposed to smoke and water.

3.12 WARRANTY: The LCU and communications devices shall be warranted against defects for a period of 18 months from time of shipment.

4 QUALITY ASSURANCE

4.1 Factory Acceptance Testing: Provide a FAT that will assure the Buyer that the hardware\software performs as required, and that attributes and specific features called out in this specification are included. Address attributes and features specifically called out in this specification referencing each section of the specification in the FAT document. This FAT must test the LCU and communication with the external PLC under simulated plant configuration. Buyer to review and approve the FAT two months prior to FAT commencement date. Buyers representative shall witness the FAT. Two weeks advances notice of the FAT shall be provided.

4.2 Site Acceptance Test: Site acceptance test to consist of two parts. An as received check out and a functional test. The test results of both of these to be recorded in the Site Acceptance Test document.

4.2.1 As Received Checkout: The as received checkout will be run with the modem cable installed. The communications to the control room OCSs shall be verified. System diagnostics shall be included to verify that the system will function. Provide 4 days of coverage minimum for this task.

4.2.2 Functional Testing: The functional testing will be done with the system control and monitoring configuration loaded. The testing will be conducted to verify that the LERF Basin pump stations will function and that communications with the external PLC will be available at the control room. Provide one week coverage minimum for this task.

4.2.3 Site Acceptance Test Document: A Site Acceptance Test (SAT) Document will be provided to record the results of the testing as it is accomplished.

4.3 Factory Assistance: Provide the following factory engineering assistance: P&IDs, an I/O list and logic diagrams will be the basis for the system configuration.

4.4 Software License Requirements: Provide Software licensing for the LCU application software.

5 SUBMITTALS - See Summary of Submittals for number of copies, purpose and when required.

5.1 General Requirements

5.1.1 Documentation shall be standard 8-1/2 by 11 inches with the exceptions of foldouts. Documentation shall be of sufficient quality to reproduce legible copies. Data shall be assembled into packages with a cover title page which identifies separate data items and individual drawings by number.

5.1.2 Data shall be identified with the purchase order (PO) number supplied by the Buyer. The item identification number shall be prominently located on the cover or the first page of each data item.

5.1.3 Data shall be identified with a descriptive title, the Seller's document number (if different from the Buyer's identification number), revision letter and revision date. Document numbers shall not exceed 20 characters including dashes.

5.2 List

5.2.1 (Item 1) Proposal: Proposal shall describe the equipment and services to be provided to meet the requirements of this Specification. In addition to explaining how each requirement is to be met, the proposal shall include an equipment list, Dimensioned drawings or sketches of all equipment cabinets, and total ac power requirements.

5.2.2 (Item 2) Design Data: Data shall include engineering drawings illustrating the LCU and interface devices. The drawings shall show all equipment cabinets and contain complete parts lists with Seller's parts numbers, quantity, and material description. In addition wiring diagrams showing all cables and wiring shall be provided. The wiring diagrams shall show termination panels for the Buyer's field devices.

5.2.2.1 Data shall include installation instructions including power and grounding requirements as well as any special handling or other installation precautions. Data shall include the following as a minimum:

a) Reproducible engineering drawings, meeting the requirements of Paragraph 3.9, including as a minimum: System Interconnect Drawings;

System Power Connect Drawings; System Hardware Drawings including block diagrams.

b) System component specifications.

c) Hardware manuals, meeting the requirements of Paragraph 3-10, including as a minimum the: LCU manual, UPS manual, Dual Data highway Interface manual, and Allen Bradley PLC-5/Interface manual or Application Note.

d) Software manuals including as a minimum: Configuration manuals on applications software use; MCS Configuration Manual that documents the custom configuration written to control the Collection System control and monitoring requirements and communications with the 242A MCS. This manual should cover how the configuration was developed and the operating philosophy and contain a printout of the configuration with associated notations for each step.

e) Installation instructions.

f) Configuration manuals.

g) Operating manuals.

h) Factory testing documentation.

5.2.3 (Item 3) Factory Acceptance Test Procedure: Provide a FAT as described in paragraph 4.1.

5.2.4 (Item 4) Documents: Provide the following documents:

a) Factory Acceptance Test report.

b) Site Acceptance Test report.

5.2.4 (Item 5) Vendor Information (VI) Data Package: The data package shall include the following as a minimum:

5.2.4.1 Hardware

a) Catalog and Illustrative Cuts

b) Specification

c) Data Sheets

d) Dimensional Drawings

e) Circuit and/or Electrical Wiring Diagrams

f) Installation Instructions

g) Operation Instructions

h) Maintenance Instructions

i) Troubleshooting Instructions

j) Recommended Spare Parts List

k) Parts List

5.2.4.2 Software

a) Catalog and Illustrative cuts.

b) Installation Instructions

c) Operation Instruction/User's guide and References

d) Troubleshooting Instructions

e) Tutorial/Workbooks

6 PREPARATION FOR DELIVERY

6.1 All components and equipment shall be packaged such that there will be no damage during shipment. All equipment shall be shipped by air ride van. The equipment shall be packaged such that it will pass through a 78 inch high by 35 inch wide door.

SUMMARY OF SUBMITTALS

ITEM	TITLE	COPIES	PURPOSE	WHEN REQUIRED
1	Proposal	5	Evaluation	With Bid
2	Design Data	6	Approval	Before Fabrication
3	FAT Procedure	6	Approval	Before Test
4	Documents	6	Review	After Receipt
5	VI Data Package	10	Vendor Information	With Shipment

Addendum for KEH Procurement Only

PARTS LIST
FOR
C-018H COLLECTION SYSTEM
LOCAL CONTROL UNIT (LCU)
AND
GENERAL GURPOSE LAN INTERFACE (GPLI)

MANUFACTURER: MICON - Powell Process Systems, Inc.
8540 Mosley Road
Houston, Texas 7705-1189
(717) 947-9470
FAX (713) 947-4486

REPRESENTATIVE: Mr. Terry Loftis

TERMS: Sole Source to Micon. Reference C-018H-P3

Item #	Quantity	U/M	A/S OPEN Part # and Description[1]
1	1		Local Control Unit (1 total) Consisting of the following. 1 Each - Controller/Termination Enclosure CTE-32:A1-B1-C2-D1-E1-F2 A1 = Terminal Strips Mounted in cabinent with factory wired harness between the terminal strips and the RCM modules. Provide sufficient number or terminal strips to service one full subrack set of controllers. Terminal strips to be three tiered Phoenix, Model DIKD 1.5-LA with LEDs for Discretes and DIKD 1.5 for Analogs. Label the terminal strips to be segregated into banks of 32 to match up to its associated RCM. Enclosure to employ a dual swing frame concept. B1 = Fan Assembly below UR-32 Rack. C2 = Local Operator Interface (LOI-32 door mtd) and UR-32 including wiring to seperate field terminals.

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1) Data From "A/S OPEN Equipment Selection and Ordering Guide" Micon - Powell Process Systems Inc, May 10, 1993 Release.

1 Each - U-32 Communications/Supervisory
U-32:A1-B1-C0
A1 = Communication Interfaces and Standard Control/Expression Fuctions.
B1 = 100% Hardware Redundancy.
C0 = LCN and LOI Interfaces.
1 Each - RCM I/O Control Module
RCM-32-"C"-A1-B1-C0
C I/O = 18 AI, 12 AO, 2 DI/DO.
A1 = Standard Control Expression Functions.
B1 = 100% Hardware Redundancy.

1 Each - RCM I/O Control Module
RCM-32-"Dr"-A1-B1-C0
Dr I/O = 32 DI/DO
A1 = Standard Control Expression Functions.
B1 = 100% Hardware Redundancy.
Note: Factory to set Jumpers as follows:

Contact #	I/O Type	State
1-24	DI	N.O.
25-32	DO	N.O.

1 Each - Mini Power Supply
PS-32A:A1-B1
A1 = 6 Amp Outout Current
B1 = 90-132 VAC Supply

1 Each - Subrack Assembly UR-32
UR-32A:A1-B1-C5-D7-E0-FZ
A1 = U-32 BackPlane
B1 = U-32 Backplane
C5 = Analog Backplane
D7 = Discrete Backplane
FZ = PS-32A Backplane

1 Each - LCU Backup Power Supply
(Special) UPS-32-A2-B1
A2 = 1200 Watts, 100 Amps
B1 = 115 VAC, 60 Hz
Note: A Standalone unit to be mounted in a free standing enclosure mounted seperate from LCU enclosure. Provide terminals in enclosure for wiring to LCU.

1 Each - General Purpose Lan Interface (GPLI)
GPLI-32:A3-B3-C1-D0
A3 = Token Passing to Star
B3 = 100% Hardware Redundacy
C1 = 105-125 VAC edundant Power Supply Module
D1 = Std

1 Each - General Purpose Lan Interface (GPLI)
GPLI-32:A3-B3-C1-D1
A3 = Token Passing to Star
B3 = 100% Hardware Redundacy
C1 = 105-125 VAC Redundant Power Supply Module
D1 = Allen Bradley PLC-5